

Amendments to the Claims

This listing of claims will replace all prior version, and listings, of claims in the application:

Listing of Claims

1. (previously presented) A system comprising:

a valve actuator coupled to a valve of an internal combustion engine, said valve actuator including at least one electromagnet having a coil wound about a core;

at least one armature fixed to an armature shaft extending axially through the core and within said coil, and axially movable relative thereto, where an axis of said coil windings of said electromagnet is parallel to movement of said armature; and

at least one permanent magnet extending at least partially into an interior portion of the coil, wherein the at least one permanent magnet is at least partially angled relative to axial movement of said shaft.

2. (currently amended) The ~~actuator~~ system of claim 1 wherein the at least one permanent magnet is rectangular in shape.

3. (currently amended) The ~~actuator~~ system of claim 1 wherein the at least one permanent magnet has a surface angled relative to axial movement of said shaft.

4. (currently amended) The ~~actuator~~ system of claim 1 wherein the at least one permanent magnet has a cross-sectional V-shape.

5. (currently amended) The ~~actuator~~ system of claim 1 wherein the at least one permanent magnet is substantially contained within said interior portion of the coil.
6. (currently amended) The ~~actuator~~ system of claim 1 further comprising an air gap adjacent to said at least one permanent magnet, said air gap configured to reduce leakage flux produced by the permanent magnet.
7. (currently amended) The ~~actuator~~ system of claim 6 wherein said core separates said coil from said air gap.
8. (previously presented) The ~~actuator~~ system of claim 1 further comprising an air gap immediately adjacent to said at least one permanent magnet, said air gap configured to reduce leakage flux produced by the permanent magnet.
9. (cancelled)
10. (currently amended) The ~~actuator~~ system of claim 1 wherein the at least one permanent magnet has a cross-sectional shape with a peak on an opposite side from said armature, and two ends extending toward said armature at an angle.
11. (currently amended) A valve actuator for an internal combustion engine, comprising:

a core having a wound coil located therein, said core further having at least one permanent magnet located at least partially inside said coil and positioned at an angle relative to a direction of movement of an armature; and

at least an air gap adjacent to said at least one permanent magnet and wherein said air gap is wholly contained in said core and configured to reduce flux leakage.

12. (currently amended) The valve actuator of claim 11 wherein ~~said angle is between 5 and 85 degrees~~ an axis of said wound coil is parallel to the movement of said armature.

13. (original) The valve actuator of claim 11 wherein said at least one permanent magnet extends substantially fully along a height of said coil.

14. (original) The valve actuator of claim 11 wherein said at least one permanent magnet is substantially fully inside said coil.

15. (cancelled)

16. (original) The valve actuator of claim 11 wherein said at least one permanent magnet includes multiple layers of permanent magnet material.

17. (previously presented) A system comprising:

a valve actuator comprising a pair of cores each having a wound coil located therein, each of said cores further having at least one permanent magnet located at least partially inside said

respective coils and positioned at an angle relative to a direction of movement of an armature, where an axis of said coil windings of said electromagnet is parallel to movement of an armature, said actuator further comprising at least an air gap adjacent to said at least one permanent magnet, said air gap configured to reduce leakage flux produced by the permanent magnet; and a cylinder valve of an internal combustion engine coupled to said armature.

18. (original) The system of claim 17 wherein said cylinder valve includes an intake valve.

19. (original) The system of claim 18 further comprising a cam actuated exhaust valve of said internal combustion engine.

20. (original) The system of claim 17 wherein said cylinder valve includes an exhaust valve.

21. (currently amended) A system comprising:

a valve actuator coupled to a valve of an internal combustion engine, said actuator including a core having a wound coil located therein, said core further having at least one permanent magnet located at least partially below said coil and positioned at an angle relative to a direction of movement of an armature, with ~~an inner part~~ a first end of said permanent magnet being located closer to said coil than ~~an outer part~~ a second end of said permanent magnet, where said ~~inner part~~ first end of said permanent magnet is closer to a center of said core than said ~~outer part~~ second end of said permanent magnet and wherein said permanent magnet is located outside the center of said core.

22. (previously presented) A valve actuator for an internal combustion engine, comprising: a core having a wound coil located therein, said core further having at least one permanent magnet located at least partially below said coil and positioned at an angle relative to a direction of movement of an armature, with an inner part of said permanent magnet being located closer to said coil than an outer part of said permanent magnet, where said inner part of said permanent magnet is closer to a center of said core than said outer part of said permanent magnet, further comprising a first gap at said inner part of said permanent magnet and a second gap at said outer part of said permanent magnet.

23. (original) The valve actuator of claim 22 wherein said permanent magnet is U-shaped.

24. (previously presented) A valve actuator for an internal combustion engine, comprising:
a core having a wound coil located therein, where an axis of said coil windings of said electromagnet is parallel to movement of an armature;
permanent magnet means for increasing magnetic flux in the actuator; and
where said permanent magnet means is located at least partially within said coil and positioned at an angle relative to a direction of movement of an armature.

25. (previously presented) The valve actuator of claim 24 wherein said means for increasing magnetic flux in the actuator comprises at least one of a straight permanent magnet, a curved permanent magnet, a segmented permanent magnet, and a permanent magnet adjacent an air gap.